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ABSTRACT

A study investigated the relationship of students' cognitive level of development and teaching methodology with student achievement. The sample was composed of 79 students in two sections of the introductory marketing course at the University of Northern Colorado. The control group was taught by a lecture strategy, and the experimental group by a creative questioning technique. Students' cognitive level of development was determined by administering the Burney Logical Reasoning Test. Student Achievement was measured by the posttest Marketing Concepts Understanding Test (MCUT) raw scores. Other factors were also examined to assess their influence on student achievement, including pretest MCUT raw scores, students' ages, and students' sex. Results of the Burney test were higher than previous cognitive studies had reported. It was also found that the experimental group was exposed to higher level questions more frequently. (Six recommendations are made for replications of this study.) (YLB)

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# AN ANALYSIS OF THE RELATIONSHIP OF TEACHING METHODOLOGY AND THE STUDENTS' LEVEL OF COGNITION WITH STUDENT ACHIEVEMENT IN PRINCIPLES OF MARKETING

A paper submitted as part of the session entitled "Perspectives in Business and Marketing Education"

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## SUMMARY OF STUDY

Hallgren, Kenneth Glenn. "An Analysis of the Relationship of Teaching Methodology and the Students' Level of Cognition with Student Achievement in Principles of Marketing." Published Doctor of Education Dissertation, University of Northern Colorado, 1980.

### Introduction

The purpose of this study was to investigate the relationship of teaching methodology and the students' cognitive level of development with student achievement. Students' cognitive level of development was determined by administering the Burney Logical Reasoning Test. Student achievement was measured by the posttest Marketing Concepts Understanding Test (MCUT) raw scores. This study was designed to facilitate a control group taught by a lecture strategy while the experimental group was instructed using a creative questioning technique. Comparisons of the posttest MCUT raw scores revealed the effects of teaching methodology and the students' cognitive level of development on student achievement. Factors other than teaching methodology and the students' cognitive level of development which may influence student achievement were also examined to estimate their contribution. These factors included: (1) the pretest Marketing Concepts Understanding Test raw scores, (2) the students' age, and (3) the students' sex.

## Description of the Sampling Population

This study consisted of 42 students in section 007 and 37 students in section 009 of the introductory marketing course (BUS 260-Marketing) at the University of Northern Colorado (UNC). The control group (section 007--taught using a straight lecture strategy) and the experimental group (section 009--taught using a creative questioning technique) met four days weekly for ten weeks. According to UNC's Spring Quarter 1980 class schedule, section 007 was scheduled from 1:35 p.m. to 2:15 p.m. Section 009 was scheduled from 3:35 p.m. to 4:25 p.m. The researcher taught both sections.

## Research Design

With slight modification, the "Before-After With Control Group" experimental design was used as shown in Figure 1.

| | BUS 260-007 | BUS 260-009 |
|---|---|---|
| Before Measurement . . . | *PR-MCUT | PR-MCUT |
| Treatment. . . . . | Lecture | Creative Questioning |
| After Measurement. . . . | **PS-MCUT | PS-MCUT |

*PR-MCUT--Pretest Marketing Concepts Understanding Test.

**PS-MCUT--Posttest Marketing Concepts Understanding Test.

Figure 1. Experimental Design

## Construction of the Marketing Concepts Understanding Test (MCUT)

Fifty multiple-choice questions were developed by the researcher using selected passages from three introductory marketing textbooks. The researcher reviewed concepts as they appear in Stanton's (1978) Fundamentals of Marketing, fifth edition, Boone and Kurtz's (1977) Contemporary Marketing, second edition, and McCarthy's (1979) Essentials of Marketing textbooks. Following the review, the researcher designed a testing instrument which required the examinee to draw from various levels of Bloom's taxonomy of cognitive behavior. The MCUT was validated by a panel of marketing professors at the University of Northern Colorado.

## Selection and Administration of the Burney Logical Reasoning Test

The cognitive operational level of the students was identified using a paper and pencil examination developed by Dr. Gilbert Burney (1974). Compton (1979) reported this test to be appropriate because of three major reasons: First, the Burney Logical Reasoning Test may be administered and evaluated by a person with a minimal amount of training; second, the examination uses the three-level classification system desired by the researcher; and third, when the Burney Logical Reasoning Test results were compared with Piaget's Task Instrument, the concurrent validity as calculated with

the Pearson Product-Moment correlation coefficient was 0.849, the reliability using the Kuder-Richardson Formula 20 was 0.704, and the classification of students as formal and nonformal thinkers by the two instruments was in 92.3 percent agreement.

## The Development and Delivery of the Teaching Methodologies

Two teaching methodologies were used in this study. The control group (section 007) was taught by a lecture strategy while the experimental group (section 009) was instructed using a creative questioning technique. The researcher, as the instructor of both sections, planned specific classroom activities to differentiate in the teaching methodology being used. For the lecture strategy, the researcher developed a simple outline of the material to guide the teacher's delivery of the content material. Although teacher and student questions could not be completely eliminated, they were kept to a minimum. Because questions could not be completely avoided, five 30-minute classroom sessions were tape recorded to facilitate an analysis of the data using the Teacher-Pupil Questions Inventory (TPQI).

In developing the creative questioning technique, the instructor planned class activities around the same basic outline that was with the lecture strategy; however, specific

questions at the various cognitive levels according to Bloom's taxonomy were developed prior to class sessions. The instructor used questions during class sessions to create an environment which required the students to discover the content material for themselves rather than it being presented by the teacher through the lecture method. In constructing the questions, the instructor followed an approach similar to the preparation of a daily lesson plan. Once the teacher had decided on the desired cognitive level, questions were constructed to enhance student responses at those levels. In addition to the preplanned questions, many of the class discussions required adjusting the questioning strategy according to the interaction within the classroom setting. Therefore, five 30-minute class sessions were tape recorded and the data was recorded using the TPQI to study the types of questions being asked. These recording were based on the same content material as the recordings for the lecture strategy.

## TPQI Construction and Usage

In developing the Teacher-Pupil Questions Inventory (TPQI), the researcher reviewed literature from several sources before deciding on a specific format.

After a fairly lengthy telephone interview with Dr. O. L. Davis, Jr., and upon his recommendation, the researcher decided to critique a modified version of the

TPQI. With the modified Clegg (1967) version, all questions and responses are coded 1 through 6 and recorded. This recording can be done by a colleague during actual class session or can be done by listening to a tape of a lesson. Hunkins (1972) provided the following example as shown in Figure 2.

Teacher _____ Date Observed _____

Grade _____

Lesson Objectives _____

1. Memory
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

Indicate the level of question by using a number of the appropriate Bloom cognitive category.

First Five Minutes

| | | |
|---|---|---|
| Teacher's Questions | Q | 1 1 2 2 2 3 2 |
| | R | 1 1 3 |
| Pupils' Questions | Q | 1 1 |
| | R | 1 1 1 2 2 3 |

Second Five Minutes

| | | |
|---|---|---|
| Teacher's Questions | Q | 4 5 |
| | R | |
| Pupils' Questions | Q | |
| | R | 4 5 |

Figure 2. Schematic of Teacher-Pupil Question Inventory

## Analysis of Data

The investigation of data involved the application of correlation techniques and multiple linear regression analysis

to study the inter-relationships of the dependent and independent variables. The schematic shown in Table 1 was used to guide the sequence of tests and analysis of data.

TABLE 1

SCHEMATIC FOR REGRESSION MODEL

| A | | | |
|---|---|---|---|
| Full Model (FM) (2-6) | | | |
| $R^2$= 0.1849 | | | |
| B | C | D | |
| FM - (2) | FM - (3) | FM - (4) (5) (6) | |
| $R^2$=_____ | $R^2$=_____ | $R^2$=_____ | |
| | E | F | |
| | FM - (4) | FM - (5) | FM - (6) |
| | $R^2$=_____ | $R^2$=_____ | $R^2$=_____ |

Variables

2 = Pretest MCUT Raw Scores
3 = Teaching Methodology.
4 = Cognitive Level of Development
5 = Students' Age.
6 = Students' Sex.

FM = Full Model.
RM - (j) = Restricted Model.
$R^2$ = Percent of Common Variance.

Note: A drop of 0.05 or more in $R^2$ indicated that the variable or variables deleted from the full model were making a significant contribution to the total explained variance within the full.

## Major Findings and Conclusions

### Results of the Burney Logical Reasoning Test

The results from the Piagetian-based paper and pencil test, the Burney, administered prior to the course of instruction are summarized in Table 2.

TABLE 2

COGNITIVE OPERATIONAL LEVEL OF THE PRINCIPLES OF MARKETING STUDENTS AT THE UNIVERSITY OF NORTHERN COLORADO AS IDENTIFIED BY THE BURNEY LOGICAL REASONING TEST

| Operational Level | BUS 260-007 | | BUS 260-009 | |
|---|---|---|---|---|
| | Number of Students | Percentage | Number of Students | Percentage |
| Formal | 29 | 69.0 | 30 | 81.1 |
| Transitional | 12 | 28.6 | 5 | 13.5 |
| Concrete | 1 | 2.4 | 2 | 5.4 |
| Totals | 42 | 100.0 | 37 | 100.0 |

These data were higher than previous cognitive studies McKinnon and Renner (1971), Renner and Lawson (1973) and Killian (1979) had reported.

### Results of the Teacher-Pupil Question Inventory

Inspection of the Teacher-Pupil Question Inventory (TPQI) revealed that the teaching methodology influenced the types and number of questions asked. The experimental group taught using the creative questioning technique was exposed to higher level questions more frequently than the control group instructed with a lecture strategy. These data are summarized in Table 3.

TABLE 3

COMPARISON OF THE QUESTIONING DATA

| Question Classification | Lecture Methodology | | | | Creative Questioning Technique | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Teacher | | Student | | Teacher | | Student | | |
| | No. of Qs | % | No. of Qs | % | No. of Qs | % | No. of Qs | % | |
| Memory | 67 | 21.5 | 43 | 13.8 | 128 | 41.2 | 73 | 23.5 | 311 |
| Comprehension | 5 | 20.8 | 2 | 8.3 | 13 | 54.2 | 4 | 16.7 | 24 |
| Application | 1 | 14.3 | 0 | 0.0 | 5 | 71.4 | 1 | 14.3 | 7 |
| Analysis | 0 | 0.0 | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 2 |
| Synthesis | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 |
| Evaluation | 0 | 0.0 | 2 | 22.2 | 3 | 33.3 | 4 | 44.4 | 9 |
| Totals | 73 | 20.6 | 47 | 13.3 | 152 | 42.9 | 82 | 23.2 | 354 |

No. of Qs--Number of Questions
%--Percentage

Note: This table is based on the analysis of five classroom observations. The data were gathered on the same content material from both the lecture methodology and the creative questioning technique.

Results for each Hypothesis

Hypothesis 1. There will be no significant difference in the portion of variance explained by the full model containing all five independent variables and the portion of variance explained by the restricted model when the pretest Marketing Concepts Understanding Test (MCUT) raw score variable is deleted from the full model. (RETAINED)

Hypothesis 2. There will be no significant difference in the portion of variance explained by the full model containing all five independent variables and the portion of variance explained by the restricted model when the creative questioning technique is deleted from the full model. (RETAINED)

Hypothesis 3. There will be no significant difference in the portion of variance explained by the full model containing all five independent variables and the portion of variance explained by the restricted model when the combined effects of the cognitive level of development, the students' age, and the students' sex variables are deleted from the full model. (REJECTED)

Hypothesis 3.1. There will be no significant difference in the portion of variance explained by the full model containing all five independent variables and the portion of variance explained by the restricted model when the cognitive level of development variable is deleted from the full model. (REJECTED)

Hypothesis 3.2. There will be no significant difference in the portion of variance explained by the full model containing all five independent variables and the portion of variance explained by the restricted model when the students' age variable is deleted from the full model. (RETAINED)

Hypothesis 3.3. There will be no significant difference in the portion of variance explained by the full model containing all five independent variables and the portion of variance explained by the restricted model when the students' sex variable is deleted from the full model. (RETAINED)

## Recommendations

The findings and conclusions generated the following recommendations for further research. If this study was replicated, the following recommendations merit consideration.

1. The inclusion of ACT/SAT scores, high school grade point averages, IQ scores, students' attitudes and aptitudes, student study skills, and the students' declared majors as variables. Brown and Holtzman (1967) developed a form to measure study skills and attitudes.

2. Increase the sample size and class sections under investigation. This should allow the researcher to gain precision and work with a wider variety of class times throughout the morning as well as the afternoon.

3. The inclusion of teaching approaches that emphasize critical thinking processes and might have potential for im-

proving student achievement. Killian (1979) reported through such programs as ADAPT, STAR, and DOORS, college instructors can teach content and cognitive development simultaneously. ADAPT, Accent on Developing Abstract Process of Thought, is a freshman program at the University of Nebraska; STAR, Steps to Abstract Reasoning, is freshman program at Metropolitan State College, Denver, Colorado; and DOORS, Development of Operation Reasoning Skills, is a freshman program at Illinois Central College. By adopting such programs or by modifying them to fit particular needs, a teaching approach may be developed which will enhance the educational environment through increasing student achievement and the critical thinking process.

4. Redesigning the Teacher-Pupil Question Inventory in order to facilitate recording the amount of Wait-Time 1 and Wait-Time 2 and the recording of the student who is responsible for the response or question. This would enable an analysis of student responses and their relationship to the students' cognitive levels of development.

5. Adopt a broader definition of inquiry methodology to include in-class exercises which require the student to discover content material and concepts for his/her self. Such an approach was followed by Marek and Renner (1979) when they used the Inquiry Role Approach (IRA) program which was designed and evaluated by the Mid-Continental Regional Educational Laboratories (1974). IRA was designed to develop attitudinal qualities. With the IRA program, a certain portion of class time is set aside for working in small groups.

Each group member is assigned specific responsibilities such as leading the group in discussions, leading the group in the performance of assigned tasks, leading the group in data and preparing graphic aids, or maintaining a daily log on individual as well as group performance. With slight modification this approach could be used in the marketing class activities. Marek and Renner (1979) found this approach not only increased student achievement, but also increased intellectual development, inquiry skills achievement, and scores on posttest IQ tests.

6. The inclusion of a posttest for determining tne cognitive level of development to study the influence of teaching methodology on the development of critical thinking abilities.

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